UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

July 28, 2000

Kate Benkert
U.S. Fish and Wildlife Service
510 Desmond Drive SE, Suite 102
Lacey, WA 98503

Re: Biological Opinion for Bull Trout Sampling Project Throughout Washington State (NMFS No. WSB-00-332)

Dear Ms. Benkert:

The attached document transmits the National Marine Fisheries Service's (NMFS) Biological Opinion (BO) based on our review of the proposal to sample bull trout throughout Washington State in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The U.S. Fish and Wildlife Service (USFWS) determined that the proposed actions are likely to adversely affect threatened and endangered fishes that occur under NMFS' jurisdiction including the following Evolutionarily Significant Units: Lower Columbia River (LCR) steelhead trout (*Oncorhynchus mykiss*); Middle Columbia River (MCR) steelhead trout; Upper Columbia River (UCR) steelhead trout; Snake River (SR) steelhead trout; LCR chinook salmon (*O. tshawytscha)*; Puget Sound (PS) chinook salmon; UCR spring chinook salmon; SR fall chinook salmon; SR spring/summer chinook; SR sockeye salmon (SR); Columbia River (CR) chum salmon (*O. keta*); and Hood Canal (HC) summer chum salmon. Formal consultation for this project was initiated on June 30, 2000.

This BO reflects formal consultation and an analysis of effects covering eight streams within the PS chinook ESU. Individual effects determinations were made for all other streams and ESU's (Not Likely to Adversely Affect or No Effect). The BO is based on information provided in the March 10, 2000 letter from the U.S. Department of Agriculture, Rocky Mountain Research Station to the USFWS and on information provided by USFWS' Lacey Field Office. A complete administrative record of this consultation is on file at the Washington State Habitat Branch Office.

The NMFS concludes that implementation of the proposed project is not likely to jeopardize the continued existence PS chinook salmon or result in destruction or adverse modification of critical habitat. In your review, please note that the incidental take statement, which includes reasonable and prudent measures and terms and conditions, was designed to minimize take.

If you have any questions, please contact Sam Brenkman of the Washington State Habitat Branch Office at (360) 534-9338.

Sincerely,

Russell M Strach for

William W. Stelle, Jr.
Regional Administrator

Enclosure

ENDANGERED SPECIES ACT-SECTION 7

BIOLOGICAL OPINION

Sampling of Bull Trout Throughout Washington State
WSB-00-332

Agency: United States Fish and Wildlife Service

Consultation Conducted By: National Marine Fisheries Service
Northwest Region
Washington State Habitat Branch

Approved _____ Date July 28, 2000
William W. Stelle, Jr.
Regional Administrator

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I. BACKGROUND INFORMATION

A. Consultation History

This document transmits the National Marine Fisheries Service's (NMFS) Biological Opinion (BO) based on our review of the proposed project to develop bull trout (*Salvelinus confluentus*) sampling and habitat protocols in streams throughout Washington State. The U.S. Fish and Wildlife Service (USFWS) is the lead agency that concluded that extensive electrofishing and snorkel surveys are likely to adversely affect the following Evolutionarily Significant Units (ESU's) in Washington: Lower Columbia River (LCR) steelhead (*Oncorhynchus mykiss*); Middle Columbia River (MCR) steelhead; Upper Columbia River (UCR) steelhead; Snake River (SR) steelhead; LCR chinook (*O. tshawytscha);* Puget Sound (PS) chinook; UCR spring chinook; SR fall chinook; Snake River spring/summer chinook; Columbia River (CR) chum salmon (*O. keta*); Hood Canal (HC) chum salmon; SR sockeye (*O. nerka*); LCR/Southwest Washington coho; and PS/Strait of Georgia (SG) coho.

Prior to this consultation, the USFWS proposed to conduct extensive electrofishing and snorkel surveys for bull trout in at least 40 streams throughout Washington. The initial scope of this study entailed multiple pass (six to seven) electrofishing in sample sites where surveyors were likely to encounter threatened and endangered salmon and steelhead under NMFS' jurisdiction. To minimize the effects of the proposed sampling activities on the ESU's listed above, the USFWS agreed to eliminate the use of electrofishing in areas of overlap between bull trout and other listed species including all streams in the UCR steelhead and UCR chinook ESU's. At present, most of the proposed sample sites for bull trout do not overlap with other listed salmonids (e.g.-sites are located upstream of barriers to anadromous salmon and steelhead) with the exception of eight streams located within the PS chinook ESU (Table 1).

The NMFS and USFWS concurred that electrofishing surveys were likely to adversely affect PS chinook salmon in up to eight streams within the ESU (Table 1). The NMFS also concluded that snorkel surveys for bull trout were not likely to adversely affect chinook, chum, sockeye, or steelhead in several streams throughout multiple ESU's. Additionally, NMFS determined that the proposed actions would have no effect on listed salmonids in streams where sample sites were located upstream of waterfalls or dams impassable to listed species.

This BO constitutes formal consultation and an analysis of effects solely for the PS chinook ESU. The objective of this BO is to determine whether the proposed actions are likely to jeopardize the continued existence of PS chinook salmon or result in the destruction or adverse modification of designated critical habitat. The BO was completed pursuant to the Endangered Species Act (ESA) and its implementing regulations (50 C.F.R 402). Information related to status of species and critical habitat also was provided for other ESU's since the initial project design included sampling in those geographic

areas. Reinitiation of consultation will be required if new sample sites are selected or if additional streams will be surveyed.

On June 30, 2000, NMFS received a written request from the USFWS for formal consultation. The BO is based on information provided in a letter from the United States Department of Agriculture, Rocky Mountain Research Station to the USFWS dated March 10, 2000. Additionally, information related to the location of sample sites was provided to NMFS on June 30, 2000. Telephone conversations related to the consultation also occurred between NMFS staff and other federal biologists on April 25; May 4; May 5; May 14; May 15; May 18; June 29; June 30; and July 5, 2000.

B. Description of Proposed Action

The USFWS is responsible for the management and recovery of bull trout populations that are listed as threatened species under ESA. At present, there is a paucity of information related to distribution and habitat requirements of bull trout throughout Washington. The USFWS' Western Washington Office proposes to conduct research to determine the presence, sampling efficiency, and habitat requirements of bull trout throughout watersheds in Washington.

The proposed research consists of two separate studies that include a sampling efficiency project and a project designed to address suitable habitat for juvenile and adult bull trout. Generally, researchers propose to conduct electrofishing, day and night snorkel surveys, and habitat surveys in at least 40 streams and rivers (Table 1). The action area for this project is eight streams located within the PS chinook ESU where electrofishing will occur. An action area is defined by NMFS regulations as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." Individual effects determinations were made for each of the other ESU's (Table 1).

1. Sampling Efficiency Study

The main hypothesis of the first study is to test whether the probability of detecting bull trout is influenced by sampling method, sampling effort, and physical habitat features. Specifically, the objectives of the sampling efficiency project are to: 1) address the probability of detecting bull trout using day snorkeling, night snorkeling, and mark-recapture electrofishing to obtain an unbiased estimate of the true population; and 2) to describe the influence of physical channel features on probabilities of detecting bull trout. Streams were selected based on known presence of bull trout, relatively high densities of bull trout (>2 bull trout/100 square meters), size of stream (less than 5 m in width), and relative accessibility to the stream. The USFWS also selected streams where there is minimal overlap with fish species listed under ESA. Sampling will occur from July to September 2000.

a. Electrofishing to Mark Fish and Installation of Block-Nets

Crews will spend ~three days at each site where block-nets will be installed the first day, day and night snorkel surveys will occur on the second day, and electrofishing will be conducted on the third day. For the purposes of marking fish as part of the sampling efficiency study, the USFWS proposes to conduct two-pass (upstream and downstream) electrofishing in up to three separate 100 m sections and one 50 m section of each stream. Block-nets will be installed for a period of up to four days at the upper and lower ends of each sample reach. To ensure that fish are not injured in the block-nets, surveyors will regularly clean the nets at each sample location. Any bull trout that is captured will be anesthetized, measured, marked (a portion of fin will be removed), and returned to the sample reach. All other salmonids will be removed from the sample reach and safely returned to the stream in an area outside of the block-nets (personal communication, David Low, USFWS on 6/29/00). If adult salmonids (>400 mm) are encountered during marking in the sample reach, the survey will be terminated and a new site will be selected. No listed salmonids under NMFS' jurisdiction will be marked during this study. All crews will undergo two weeks of training with field testing and certification for electrofishing. and surveyors will be trained to avoid areas where other fish are spawning.

b. Snorkel Surveys

To determine relative abundance of salmonids in the sample reach, day snorkel surveys will be conducted (between 1000 and 1700) at least 24 hours after the release of marked bull trout. Night snorkel surveys also will occur throughout each sample reach from 2230 and 0430. In a subsample of units, bull trout will be captured with hand nets and inspected for marks and measured.

c. Multiple Pass Electrofishing and Handling of Fish

After the completion of the day and night snorkel surveys, multiple pass electrofishing will be used to remove salmonids from each 100 m stream reach. A total of four to five passes per reach will occur in addition to the initial two passes conducted to mark bull trout. Electrofishing will continue throughout the reach until catches decline by 75% or more between successive passes. Again, each bull trout will be removed, anesthetized, and measured. Bull trout will be placed in live wells, and other listed salmonids will be removed and safely released outside the sample reach (personal communication, David Low, USFWS on 6/29/00). Results will provide information on sampling efficiency of bull trout and relative abundance of other salmonids.

d. Physical Habitat Variables

Physical habitat conditions will be classified throughout five intervals in each 100 m sample reach. At each transect, surveyors will record measurements of wetted channel width, habitat type (fast vs. slow units), mean water depth, maximum water depth, type of substrates, water conductivity, velocity, elevation, number of pieces of large wood, and percent of cover.

2. Bull Trout Habitat Study

The primary objective of the second study is to characterize habitats occupied or not occupied by bull trout. The ultimate goal of this project is to develop models to evaluate suitable habitat for juvenile and adult bull trout in Washington. The study design requires crews to conduct sampling in 100 m reaches that are spaced every 2 km for the entire length of each stream.

a. Sampling of Salmonids

In mid-summer 2000, actual distribution limits of bull trout will be determined in selected streams via snorkel surveys (Table 1). Electrofishing will not be conducted during this study. Day snorkel surveys will be conducted in portions of stream inhabited by bull trout from 1000 to 1700 and night snorkels will occur from 2230 to 0430. Block-nets will be installed at the upper and lower end of each 100 m section for a period of up to four days. To ensure that fish are not injured in the block-nets, surveyors will regularly check and clean the nets at each sample location.

b. Physical Data

Thermographs will be installed in the vicinity of each 100 m sample reach and removed in October**.** Upon retrieval of the thermographs, crews also will conduct redd surveys. Other habitat variables to be measured include: water conductivity; wetted channel width; mean depth; substrate composition; bankfull width; number of pieces of large woody debris; and stream gradient.

Table 1. Location of sampling sites for bull trout and determination of whether USFWS sample sites overlap with the presence of Pacific salmon and steelhead ESU's in Washington State (personal communications with State and Federal biologists). Effects determinations include the following: 1) No effect=survey will occur upstream of impassable portion of stream that clearly is not accessible to anadromous salmonids (e.g.-upstream of dam or impassable waterfall); 2) Not likely to adversely affect (NLAA)=day and night snorkel surveys in areas with or without overlap between bull trout and other salmonids; and 3) Likely to adversely affect (LAA)=electrofishing in streams inhabited by chinook, chum, sockeye, and/or steelhead (in boldface).

Stream	**Basin**	**RKm**	**Sampling Methods (EF= Electrofishing , DS=Day Snorkel, NS=Night Snorkel)**	**ESU's Under NMFS' Jurisdiction**	**Likely to Encounter Listed Salmonids**	**NMFS Effects Determination**
SF Ahtanum Cr.	Yakima	lower 10 km	DS, NS	MCR steelhead	Yes	NLAA
NF Ahtanum Cr.		lower 10 km	DS, NS	MCR steelhead	Yes	NLAA

MF Ahtanum Cr.		lower 10 km	DS, NS	MCR steelhead	Yes	NLAA
Stream	**Basin**	**RKm**	**Sampling Methods (EF= Electrofishing , DS=Day Snorkel, NS=Night Snorkel)**	**ESU's Under NMFS' Jurisdiction**	**Likely to Encounter Listed Salmonids**	**NMFS Effects Determination**
Ahtanum Cr. main		18.9+	DS, NS	MCR steelhead	Yes	NLAA
Bear Cr.	(Tieton)	lower 1 km above dam	DS, NS, EF	MCR steelhead	No	No effect
Indian Cr.		above dam	DS, NS, EF	MCR steelhead	No	No effect
Deep Cr.		above dam	DS, NS, EF	MCR steelhead	No	No effect
Union Cr.		above dam	DS, NS, EF	MCR steelhead	No	No effect
Mineral Cr.	(Kaches)	above dam	DS, NS, EF	MCR steelhead	No	No effect
NF Touchet R.	Touchet	NA	DS, NS	MCR steelhead	Yes	NLAA
Spangler Cr.	(NF Touchet)	NA	DS, NS	MCR steelhead	Yes?	NLAA
SF Touchet R.		NA	DS, NS	MCR steelhead	NA	NLAA
Burnt Fork	(SF Touchet)	NA	DS, NS	MCR steelhead	NA	NLAA
Griffin Fork		NA	DS, NS	MCR steelhead	NA	NLAA
Green Fork		NA	DS, NS	MCR steelhead	NA	NLAA
Wolf F Touchet		NA	DS, NS	MCR steelhead	NA	NLAA
Upper Tucannon R.	Tucannon	upper 50 km	DS, NS	-SR steelhead -SR fall chinook -SR spring/summer chinook	Yes	NLAA

Panjab Cr.	Tucannon	NA	DS, NS	-SR steelhead -SR spring/summer chinook -SR fall chinook -SR sockeye	NA	NLAA
Stream	**Basin**	**RKm**	**Sampling Methods (EF= Electrofishing , DS=Day Snorkel, NS=Night Snorkel)**	**ESU's Under NMFS' Jurisdiction**	**Likely to Encounter Listed Salmonids**	**NMFS Effects Determination**
Meadow Cr.	Tucannon	NA	DS, NS	-SR steelhead -SR Spring/Summer chinook -SR fall run chinook -SR sockeye	NA	NLAA
Turkey Cr.	Tucannon	NA	DS, NS	-SR steelhead -SR Spring/Summer chinook -SR fall run chinook -SR sockeye	NA	NLAA
Upper Twisp R.	Methow	lower 32 km	DS, NS	UCR steelhead and UCR chinook	Yes	NLAA
WF Buttermilk	(Twisp)	lower 8 km	DS, NS	UCR steelhead and UCR chinook	Yes	NLAA
Early Winters Cr.		12.5+, above impassable falls	DS, NS	UCR steelhead and UCR chinook	Yes (resident rainbow?)	NLAA
Upper Chiwawa R.	Wenatchee	lower 40 km	DS, NS	UCR steelhead and UCR chinook	Yes	NLAA
Rock Cr.		NA	DS, NS	UCR steelhead and UCR chinook	NA	NLAA

Chicamin Cr.		NA	DS, NS	UCR steelhead and UCR chinook	NA	NLAA
Phelps Cr.		lower 40 km	DS, NS	UCR steelhead and UCR chinook	Yes	NLAA
Stream	**Basin**	**RKm**	**Sampling Methods (EF= Electrofishing , DS=Day Snorkel, NS=Night Snorkel)**	**ESU's Under NMFS' Jurisdiction**	**Likely to Encounter Listed Salmonids**	**NMFS Effects Determination**
Mill Cr.	(Nason Cr.)	lower 1 km	DS, NS	UCR steelhead and UCR chinook	Yes	NLAA
SF Skokomish R.	Skokomish	lower 32 km	DS, NS	PS chinook, HC chum, PS/SG coho	No	No effect
Church Cr.	Skokomish	lower 2 km	DS, NS, EF	PS chinook, HC chum, PS/SG coho	No	No effect
S. F. Sauk R.	Skagit	64-82	DS, NS	PS chinook, PS/SG coho	Yes	NLAA
Glacier Cr.	(Sauk)	lower 4 km	DS, NS, EF	PS chinook, PS/SG coho	No	No effect
Illabot Cr.	Skagit	17.7-19.3	DS, NS, EF	PS chinook, PS/SG coho	No	No effect
NF Skykomish	(Snohomish)	24-40	DS, NS	PS chinook, PS/SG coho	Yes	NLAA
Troublesome Cr	(Snohomish)	Upstream of barrier (2 km)	DS, NS	PS chinook, PS/SG coho	Yes	NLAA
Goblin Cr.	(Snohomish)	lower 1 km	DS, NS	PS chinook, PS/SG coho	No	No effect
Buck Cr.	**(Suiattle)**	**upstream of 3.2**	**DS, NS, EF**	**PS chinook, PS/SG coho**	**Yes**	**LAA**
Sulphur Cr.		**Upstream of 2.4**	**DS, NS, EF**	**PS chinook, PS/SG coho**	**Yes**	**LAA**

Downey Cr.		**upstream of 2.4**	**DS, NS, EF**	**PS chinook, PS/SG coho**	**Yes**	**LAA**
Thompson Cr.	**NF Nooksack**	**NA**	**DS, NS, EF**	**PS chinook**	**Yes?**	**LAA**
Rex R.	Cedar	above dam	DS, NS, EF	PS chinook	No	No effect
Stream	**Basin**	**RKm**	**Sampling Methods (EF= Electrofishing , DS=Day Snorkel, NS=Night Snorkel)**	**ESU's Under NMFS' Jurisdiction**	**Likely to Encounter Listed Salmonids**	**NMFS Effects Determination**
Silver Springs Cr.	**Puyallup /White**	**lower 1km**	**DS, NS, EF**	**PS chinook**	**Yes**	**LAA**
Huckleberry Cr.		**NA**	**DS, NS, EF**	**PS chinook**	**Yes**	**LAA**
Clearwater Cr.		**NA**	**DS, NS, EF**	**PS chinook**	**Yes**	**LAA**
Greenwater R.		**NA**	**DS, NS, EF**	**PS chinook**	**Yes**	**LAA**
George Cr.	(Greenwater)	NA	DS, NS, EF	PS chinook	No	No effect
Rush Cr.	Lewis	above dam	DS, NS, EF	LCR chinook, LCR steelhead, and CR chum	No	No effect

II. STATUS OF SPECIES AND CRITICAL HABITAT

A. Lower Columbia River Chinook Salmon

Lower Columbia River chinook salmon were listed as a threatened species under the ESA on March 24, 1999 (64 Fed. Reg. 14309). Critical habitat for LCR chinook was designated on February 16, 2000 (65 Fed. Reg. 7774). In Washington State, the LCR chinook ESU includes all naturally spawned chinook populations from the mouth of the Columbia River to the Cascade Crest.

Critical habitat in Washington includes all river reaches accessible to chinook salmon in Columbia River tributaries between the Grays River and White Salmon River. Factors for decline of the LCR chinook were attributed to habitat degradation associated with forest practices, urbanization, hydroelectric dams, and agricultural practices. The LCR chinook also have been negatively influenced by genetic introgression from artificial propagation (63 Fed. Reg. 11495; March 9, 1998).

B. Puget Sound Chinook Salmon

Puget Sound chinook salmon were listed as threatened species under the ESA on March 24, 1999 (64 Fed. Reg. 14308). Critical habitat for PS chinook was designated on February 16, 2000 (65 Fed. Reg. 7773). The ESU includes all naturally spawned populations of chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington. Chinook salmon (and their progeny) from the following hatchery stocks are considered part of the listed ESU: Kendall Creek (spring run); North Fork Stillaguamish River (summer run); White River (spring run); Dungeness River (spring run); and Elwha River (fall run).

Critical habitat includes all marine, estuarine, and river reaches accessible to listed chinook salmon in Puget Sound. Puget Sound marine areas include South Sound, Hood Canal, and North Sound to the international boundary at the outer extent of the Strait of Georgia, Haro Strait and the Strait of Juan De Fuca to a straight line extending north from the west end of Freshwater Bay, inclusive. Also included are adjacent riparian zones. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,761 square miles in Washington. The following counties are partially or entirely within these basins (or contain migration habitat for the species): Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Lewis, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom.

C. Upper Columbia River Chinook Salmon

The UCR spring chinook salmon were listed as endangered pursuant to the ESA on March 24, 1999 (64 Fed. Reg. 14308). Critical habitat for the chinook was designated on February 16, 2000 (65 Fed. Reg. 7774). The UCR spring chinook ESU includes stream-type salmon that spawn upstream of the Rock Island Dam in the Wenatchee, Entiat, and Methow Rivers and their tributaries.

As designated, critical habitat includes all river reaches accessible to listed steelhead in Columbia River tributaries upstream of the Yakima River, Washington, and downstream of Chief Joseph Dam. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 9,545 square miles in Washington. In Washington, the following counties are partially or entirely within these basins: Benton, Chelan, Clark, Cowlitz, Douglas, Franklin, Gilliam, Grant, Kittitas, Klickitat, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima.

D. Snake River Fall Chinook Salmon

The listed ESU includes all natural populations of fall-run chinook salmon in the main stem Snake River and any of the following subbasins: Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River. Critical habitat for the listed ESU is designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River fall chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; the Snake River, all river reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,679 square miles in Idaho, Oregon, and Washington. The following counties are partially or entirely within these basins: Idaho - Adams, Clearwater, Idaho, Latah, Lemhi, Lewis, and Nez Perce; Oregon - Baker, Union, and Wallowa; Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

E. Snake River Spring/Summer Chinook Salmon

The ESU includes all natural populations of spring/summer-run chinook salmon in the mainstem Snake River and any of the following subbasins: Tucannon River, Grande Ronde River, Imnaha River, and Salmon River. Critical habitat is designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River spring/summer chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 22,390 square miles in Idaho, Oregon and Washington. The following counties are partially or entirely within these basins: Idaho - Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, and Valley; Oregon - Baker, Umatilla, Union, and Wallowa; Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

F. Lower Columbia River Steelhead Trout

Lower Columbia River steelhead trout were listed as threatened under the ESA on March 19, 1998 (63 Fed. Reg. 13347). Critical habitat for steelhead was designated on February 16, 2000 (65 Fed.

Reg. 7775). In Washington, the LCR steelhead ESU includes winter and summer steelhead in tributaries to the Columbia River between the Cowlitz River and Wind River, inclusive (Busby et al. 1996).

Critical habitat includes all river reaches accessible to listed steelhead in Columbia River tributaries between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Hood River in Oregon. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 5,017 square miles in Oregon and Washington. In Washington, the following counties are partially or entirely within these basins (or contain migration habitat for the species): Clark, Cowlitz, Lewis, Pacific, Skamania, and Wahkiakum.

G. Middle Columbia River Steelhead Trout

Middle Columbia River steelhead trout were listed as threatened under the ESA on March 25, 1999. Critical habitat for steelhead was designated on February 16, 2000. This ESU includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington. Excluded are steelhead from the Snake River Basin.

Critical habitat is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries (except the Snake River) between Mosier Creek, Oregon and the Yakima River, Washington (inclusive). Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Yakima River in Washington. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 26,739 square miles in Oregon and Washington. In Washington, the following counties lie partially or wholly within these basins (or contain migration habitat for the species: Benton, Clark, Columbia, Cowlitz, Franklin, Kittitas, Klickitat, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima.

H. Upper Columbia River Steelhead Trout

The UCR steelhead were listed as endangered pursuant to the ESA on August 18, 1997 (62 Fed. Reg. 43937). The UCR steelhead ESU includes all naturally spawned populations of in streams in the

Columbia River and its tributaries that occur upstream from the confluence with the Yakima River, Washington to the United States-Canada border. Wells Hatchery stock steelhead are also part of the listed ESU.

Critical habitat for the steelhead was designated on February 16, 2000 (65 Fed. Reg. 7775). Critical habitat is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries upstream of the Yakima River, Washington, and downstream of Chief Joseph Dam. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 9,545 square miles in Washington. The following counties are partially or entirely within these basins (or contain migration habitat for the species): Oregon - Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Sherman, Umatilla, and Wasco; Washington - Benton, Chelan, Clark, Cowlitz, Douglas, Franklin, Gilliam, Grant, Kittitas, Klickitat, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima.

I. Snake River Steelhead Trout

The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho. Critical habitat includes all river reaches accessible to listed steelhead in the Snake River and its tributaries in Idaho, Oregon, and Washington. Also included are adjacent riparian zones, as well as river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence with the Snake River. Excluded are tribal lands and areas above specific dams identified or above longstanding, naturally impassable barriers (i.e., Napias Creek Falls and other natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 29,282 square miles in Idaho, Oregon, and Washington. The following counties are partially or entirely within these basins (or contain migration habitat for the species): Idaho - Adams, Blaine, Boise, Clearwater, Custer, Idaho, Latah, Lemhi, Lewis, Nez Perce, and Valley; Oregon - Baker, Clatsop, Columbia, Hood River, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, and Wasco; Washington - Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Gilliam, Klickitat, Skamania, Wahkiakum, Walla Walla, and Whitman.

J. Columbia River Chum Salmon

Columbia River chum salmon were listed as threatened under the ESA on March 25, 1999 (64 Fed. Reg. 14507). Critical habitat was designated on February 16, 2000 and includes accessible reaches of

the Columbia River (including estuaries and tributaries) downstream from Bonneville Dam to the river mouth. Critical habitat includes all river reaches accessible to listed chum salmon (including estuarine areas and tributaries) in the Columbia River downstream from Bonneville Dam, excluding Oregon tributaries upstream of Milton Creek at river km 144 near the town of St. Helens. Also included are adjacent riparian zones. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 4,426 square miles in Oregon and Washington. In Washington, the following counties are partially or entirely within these basins Clark, Cowlitz, Lewis, Pacific, Skamania, and Wahkiakum.

K. Hood Canal Summer Chum Salmon

Hood Canal summer chum salmon were listed as a threatened species on March 25, 1999. Critical habitat was designated on February 16, 2000. The ESU includes all naturally spawned populations of summer-run chum salmon in Hood Canal and it tributaries as well as populations in Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington.

Critical habitat is designated to include all river reaches accessible to listed chum salmon (including estuarine areas and tributaries) draining into Hood Canal as well as Olympic Peninsula rivers between and including Hood Canal and Dungeness Bay, Washington. Also included are adjacent riparian zones and estuarine/marine areas of Hood Canal, Admiralty Inlet, and the Straits of Juan De Fuca to the international boundary and as far west as a straight line extending north from Dungeness Bay. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 1,753 square miles in Washington. The following counties are partially or entirely within these basins (or contain migration habitat for the species): Clallam, Island, Jefferson, Kitsap, and Mason.

L. Snake River Sockeye Salmon

The ESU includes populations of sockeye salmon from the Snake River Basin, Idaho (extant populations occur in the Stanley River subbasin). Critical habitat is designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River sockeye salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek, and that portion of Valley Creek between Stanley Lake Creek and the Salmon River. Watersheds

containing spawning and rearing habitat for this ESU comprise approximately 510 square miles in Idaho. The watersheds are partially or entirely within the following counties: Blaine and Custer.

M. LCR/Southwest Coho Salmon

On July 25, 1995, NMFS determined that listing was not warranted for the LCR/SW coho salmon. However, the ESU is a candidate for listing because of concerns over specific risk factors. The ESU includes all naturally spawned populations of coho salmon from Columbia River tributaries below the Klickitat River on the Washington side and below the Deschutes River on the Oregon side (including the Willamette River as far upriver as Willamette Falls), as well as coastal drainages in southwest Washington between the Columbia River and Point Grenville. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 10,418 square miles in Oregon and Washington. In Washington, the following counties are partially or entirely within these basins: Clark, Cowlitz, Grays Harbor, Jefferson, Klickitat, Lewis, Mason, Pacific, Skamania, Thurston, and Wahkiakum.

N. Puget Sound/Strait of Georgia Coho Salmon

On July 25, 1995, NMFS determined that listing was not warranted for this ESU. However, the ESU is a candidate for listing because of concerns over specific risk factors. The ESU includes all naturally spawned populations of coho salmon from drainages of Puget Sound and Hood Canal, the eastern Olympic Peninsula (east of Salt Creek), and the Strait of Georgia from the eastern side of Vancouver Island and the British Columbia mainland (north to and including the Campbell and Powell Rivers), excluding the upper Fraser River above Hope. Major U.S. river basins containing spawning and rearing habitat for this ESU comprise approximately 13,821 square miles in Washington. The following counties are partially or entirely within these basins: Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Kittitas, Lewis, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom.

Table 2. The following references contain specific information related to the listing status, life histories, and critical habitats for listed salmonids in Washington State.

Fish Species and ESU	**Threatened or Endangered**	**Listing Status**	**Critical Habitat**	**Citations for Biological Information**
Lower Columbia River Chinook Salmon	Threatened	64 Fed. Reg. 14308; 3/24/99	65 Fed. Reg. 7774; 2/16/00	Myers et al. 1998
Puget Sound Chinook Salmon	Threatened	64 Fed. Reg. 14308; 3/24/99	65 Fed. Reg. 7773; 2/16/00	Myers et al. 1998
Upper Columbia River Spring Chinook Salmon	Endangered	64 Fed. Reg. 14308; 3/24/99	63 Fed. Reg.11482; 3/9/98	Myers et al. 1998
Snake River Fall Chinook Salmon	Threatened	57 Fed. Reg. 36653; 4/22/92	58 Fed. Reg. 68543; 12/28/93	Myers et al. 1998
Snake River Spring/Summer Chinook Salmon	Threatened	57 Fed. Reg. 34653; 4/22/92	58 Fed. Reg. 68543; 12/28/93	Healey 1991
Lower Columbia River Steelhead Trout	Threatened	63 Fed. Reg. 13347; 3/19/98	65 Fed. Reg. 7775; 2/16/00	Busby et al. 1996; NMFS 1996
Middle Columbia River Steelhead Trout	Threatened	64 Fed. Reg. 14517; 3/25/99	65 Fed. Reg. 7775; 2/16/00	Busby et al. 1996
Upper Columbia River Steelhead Trout	Endangered	62 Fed. Reg. 43937; 8/18/97	2/5/99	Busby et al. 1996
Snake River Steelhead Trout	Threatened	62 Fed. Reg. 43937; 8/18/97	2/5/99	Busby et al. 1996
Snake River Sockeye Salmon	Endangered	56 Fed. Reg. 58619; 11/20/91	58 Fed. Reg. 68543; 12/28/93	Gustafson et al. 1997
Hood Canal Chum Salmon	Threatened	64 Fed. Reg. 14507; 3/25/99	63 Fed. Reg. 11774; 3/10/98	Johnson et al. 1997; Salo 1991
Columbia River Chum Salmon	Threatened	64 Fed. Reg. 14507; 3/25/99	65 Fed. Reg. 7774; 2/16/00	Johnson et al. 1997

III. EVALUATING THE PROPOSED ACTIONS

The standards for determining jeopardy are set forth in Section 7(a)(2) of the ESA as defined by 50 C.F.R Part 402 (the consultation regulations). The NMFS must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of (1) defining the biological requirements of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NMFS must consider the estimated level of mortality attributed to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life stages that occur beyond the action area. If NMFS finds that the action is likely to result in jeopardy, NMFS must identify reasonable and prudent alternatives for the action.

Furthermore, NMFS evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' critical habitat. The NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. The NMFS identifies those effects of the action that impair the function of any essential element of critical habitat. The NMFS then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NMFS concludes that the action will adversely modify critical habitat it must identify any reasonable and prudent alternatives available.

For the proposed action, NMFS's jeopardy analysis considers direct or indirect mortality of fish attributable to the action. The NMFS critical habitat analysis considers the extent to which the proposed action impairs the function of essential habitat elements including spawning, rearing, feeding, sheltering, or migration of PS chinook within the action area, when viewed in relation to the status of habitat throughout the ESU.

A. Biological Requirements

The relevant biological requirements are those necessary for PS chinook to survive and recover to naturally reproducing population levels at which time protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

Myers et al. (1998) and Healey (1991) reported on life histories, population trends, and biological requirements of chinook salmon. At present, the biological requirements of PS chinook salmon are not being met under the environmental baseline. To improve the status of the listed species, significant

improvements in the environmental conditions of designated critical habitat are needed.

B. Status of the Species within Action Area

The abundance of chinook salmon in the Puget Sound has substantially declined when compared to historical levels. The five year geometric mean of spawning escapement of natural chinook runs in the North Puget Sound is ~13,000 fish from 1992 to 1996 (Myers et al. 1998).
The Suiattle Basin population is currently classified as depressed based on chronically low escapement estimates (WDFW and WWTIT 1994). Escapements in the Suiattle Basin averaged 667 fish from 1974 to 1991 (e.g.-Buck, Downey, and Sulphur Creeks). Spring chinook in the White River are chronically in low abundance although inadequate data exist to address the level of natural spawners in the basin. Hatchery production likely reduced the genetic integrity of White River spring chinook. Summer/fall chinook also may inhabit the White River Basin although observations indicate that the summer/fall component may actually be part of the spring chinook and not a distinct stock (WDFW and WWTIT 1994). White River chinook were determined to be essential to the recovery of the PS chinook ESU (64 Fed. Reg. 14314; March 24, 1999). The exact status of chinook in Huckleberry Creek remains unknown although past redd surveys have been conducted. Chinook also may use Silver Springs Creek (personal communication, Don Nauer, WDFW).

C. Factors Affecting Species in Action Area

Generally, modification of habitat, overutilization for recreational purposes, and natural and human-made factors are primary reasons for the decline of chinook salmon (63 Fed. Reg. 11498; March 9, 1998). In the action area that includes eight streams within the PS chinook ESU, factors for decline of the PS chinook have been attributed to habitat degradation by forest practices, barriers to migration, diking for flood control, agriculture, urbanization, and shifts in flow regime as the result of hydroelectric development and flood control projects. Tributaries in the upper portion of watersheds typically have been negatively influenced by forest practices and lower tributaries and main stem rivers have been impacted by agriculture and urbanization. High rates of harvest throughout the years (up to 90% exploitation on some stocks) also have contributed to the decline of PS chinook salmon.

D. Environmental Baseline

The environmental baseline represents the current set of basal conditions to which the effects of the proposed action are then added. Environmental baseline is defined as “the past and present impacts of all Federal, State, and private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or informal ESA section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation process” (50 C.F.R 402.02). The term “action area” is defined as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action”.

The NMFS is informed of a myriad of factors that negatively influence current baseline conditions in the Puyallup River Basin. Declines in chinook salmon may be attributed impacts associated with dredging, hydroelectric dams, levees, dikes, and the diversion of the White River that doubled flows into the Puyallup River (Washington State Conservation Commission 2000). Additionally, loss of highly productive estuarine habitat in Commencement Bay modified chinook habitat. The Puyallup River was included on the Washington Department of Ecology's 303d list for instream flow issues.

The Puyallup, White and Carbon Rivers are all contained within a revetment and levee system for their lower 26, 8 and 5 miles, respectively. The channel containment structures eliminated the natural sinuosity of those rivers. Additionally, two hydroelectric dams and a flood control project on the White River eliminated chinook from historical habitats and further reduced their geographical distribution. Numerous other impassable barriers exist on smaller tributary streams (Washington State Conservation Commission 2000). The White River was included on the 303d list of impaired waters for exceeding water temperature, fecal coliform, pH, and instream flow standards.

There is a lack of information related to the environmental baseline of the Suiattle Basin and tributaries to the North Fork Nooksack River. Based on Bilby et al. (2000), the lower mainstem Nooksack is lined with levees, dairy farms, and the remains of side channels and beaver marshes. The headwaters consist of steep ephemeral channels in commercial forest land with numerous logging roads. The middle reaches of the river contain high quality chinook spawning grounds. In 1899, the Kendall Creek hatchery was constructed on the North Fork where fisheries have been managed largely for hatchery production. To date, physical habitat variables affecting wild salmonids in the Nooksack Basin remain unknown. The Washington Department of Ecology has ongoing efforts to identify relative habitat and water quality conditions in each watershed.

IV. EFFECTS OF THE PROPOSED ACTION

The proposed actions are likely to adversely affect PS chinook salmon as determined by the USFWS. The ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline". "Indirect effects" are defined as those that are caused by the proposed action at a later time, but still are reasonably certain to occur (50 CFR 402.02).

A. Direct Effects

Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result

from the agency action and include the effects of interrelated and interdependent actions. Future Federal actions that are not interrelated to or interdependent on the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated.

To evaluate direct and indirect effects associated with electrofishing, it is critical to address elements of the life history of PS chinook. The PS chinook ESU encompasses all naturally spawned spring, summer, and fall runs of chinook. The chinook in this ESU generally exhibit an ocean-type life history spending only a few months in freshwater before migration to sea although some spring-run populations have a high proportion of yearling smolt emigrants (e.g.-stream type). Typically, chinook in the Puget Sound mature at three and four years of age. The timing of upstream migration of adult chinook typically occurs from spring to fall, and spawning occurs from July to October. Eggs hatch in about two months depending on water temperatures, and the young remain in the gravel for two to three weeks after hatching (Wydoski and Whitney 1979).

Specifically, spring chinook in the Suiattle Basin spawn from late July to early September. Spring chinook typically enter the White River (e.g.-Clearwater Creek and Greenwater River) in May through mid-October and spawn primarily in September. This timing differs from all other south PS chinook populations (WDFW and WWTIT 1994). Additionally, summer/fall chinook may spawn in October in the Greenwater River and Clearwater Creek (WDFW and WWTIT 1994).

1. Electrofishing and Handling of Fish

The NMFS expects that multiple pass (six to seven passes) electrofishing will injure or kill juvenile and/or adult chinook salmon. The timing of electrofishing surveys clearly overlaps with the upstream migration of adult chinook, spawn timing, juvenile rearing, or the period of egg incubation. Surveyors are not likely to encounter young-of-the-year chinook during electrofishing surveys.

The impacts associated with electrofishing will occur in at least six and up to eight streams throughout the PS chinook ESU where there is distinct overlap between bull trout and chinook salmon (Downey Creek, Sulphur Creek, Buck Creek, Huckleberry Creek, Clearwater Creek, Greenwater River, possibly Silver Springs Creek, and possibly Thompson Creek) (personal communications, Doug Huddle, Curt Kraemer, and Don Nauer, WDFW). A total of 2,800 m of stream length will be subject to multiple pass electrofishing during the Bull Trout Sampling Efficiency Project.

Authors suggest that electrofishing in the presence of endangered and threatened species should be considered with great caution (Sharber and Carothers 1988; Nielsen 1998). Electrofishing may result in direct mortality to salmonids. In Oregon, short-term mortality (within 72 hours) of brook trout (*Salvelinus fontinalis)* was 10% after single pass electrofishing (Mahoney 1997). Previous studies that used similar methodologies as the current project reported that direct mortality of bull trout was less than 1% (three mortalities out of 581 fish) when electrofishing was conducted by experienced crew members. Generally, the relative effects of electrofishing at the population level remain unknown.

Physical injuries from electrofishing include internal hemorrhaging, spinal misalignment, or fracture of vertebrae. Mahoney (1997) observed 63% of brook trout and brown trout had hemorrhages and spinal injuries after extensive multiple pass electrofishing. Thompson et al. (1997) reported that electrofishing caused spinal injuries ranging from 6 to 40% of rainbow trout and 27-38% of brown trout. Similarly, 24% of trout sampled suffered spinal injuries and/or hemorrhaging from AC and DC electrofishing units (Hollender and Carline 1994). Generally, injury rates are positively correlated with the length of fish. Electrofishing also may significantly lower survival of eggs (Dwyer et al. 1993) and harm developing embryos and larvae of endangered fish (Muth and Ruppert 1997).

Many factors influence the relative effects of electrofishing on fish including conductivity of water, depth of water, substrate, and size of the fish. Additionally, the amount of time taken to complete electrofishing within the sample area, the frequency of sampling through time, crew efficiency, and operator skill have been mentioned as factors influencing the magnitude of electrofishing effects.

2. Block-nets

The installation of block-nets may cause impingement of chinook and subsequent injury or mortality. To reduce the likelihood of injury or mortality to fish, the USFWS will monitor the nets at least two times per day. Block-nets also will temporarily prevent upstream and downstream movements of juvenile or adult chinook at the site level for up to four days.

3. Snorkel Surveys

The effects of day and night snorkeling on PS chinook likely will be negligible in each stream. To avoid trampling of redds, surveyors will conduct spawner surveys for salmonids immediately before entering the sample reach.

4. Habitat Surveys and Redd Surveys

Habitat surveys and redd surveys presumably will have no effect on chinook salmon or their designated critical habitat although surveyors wading in the river may cause trampling of eggs when eggs are in the gravel (Roberts and White 1992). To avoid trampling of redds, surveyors shall ensure that no adult fish or redds are present prior to each habitat survey. Additionally, crews will be trained to detect redds.

B. Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action. Indirect effects may include the effects of other Federal actions that have not undergone section 7 consultation but will result from the action under consideration. These actions must be reasonably certain to occur, or be a logical extension of the proposed action.

Numerous indirect or sublethal effects have been associated with electrofishing including behavioral changes, physiological stress, and reduced growth (Dwyer and White 1995; Thompson et al. 1997). Multiple pass electrofishing also may result in sublethal injuries to fish after repeated surveys throughout time (Kocovsky et al. 1997). Additional indirect effects that may occur later in time include stress associated with the handling of fish or bucket predation. Under the proposed actions, indirect effects will be minimized by immediate release of listed salmonids outside the netted area.

C. Effects on Critical Habitat

The proposed actions will not effect, and therefore will not adversely modify designated critical habitat for the Puget Sound ESU. The NMFS designates critical habitat based on physical and biological features that are essential to each listed species. Essential features for designated critical habitat include stream substrate, water quality, water quantity, water temperature, water velocity, food, riparian vegetation, access, and safe passage conditions for fish.

D. Cumulative Effects

Cumulative effects are defined as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (50 C.F.R 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Future federal actions related to hydroelectric systems, hatcheries, fisheries, and land management activities will be reviewed through separate section 7 consultations.

The proposed actions are not expected to result in cumulative impacts to habitat. Instead, any mortality or injury to individual fish will be additive to the existing habitat conditions.

VII. CONCLUSION

The NMFS expects that the use of multiple pass electrofishing will cause injury and/or result in mortality to listed fish. The actions are not expected to result in the destruction or adverse modification of designated critical habitat. The NMFS concludes that the proposed actions are not likely to jeopardize the continued existence of PS chinook. The determination of no jeopardy was based on the following: 1) electrofishing surveys will occur during summer months when crews are least likely to encounter young-of-the-year; 2) no electrofishing surveys will be conducted in the presence of adult chinook or their redds; 3) injury or mortality associated with electrofishing will be minimized through the implementation of numerous conservation measures in the project design; and 4) USFWS will conduct surveys in locations within streams where there is minimal overlap between bull trout and listed salmonids. Overall, the proposed activities will not appreciably reduce the likelihood of survival and recovery of the listed salmonids.

VIII. REINITIATION OF CONSULTATION

This concludes formal consultation for the bull trout sampling project in Washington. Construction must cease and consultation must be reinitiated if: the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; new information reveals effects of the action may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; or, a new species is listed or critical habitat is designated that may be affected by the action (50 C.F.R 402.16).

IX. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4 (d) of the Act prohibit the take of endangered and threatened species without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct of listed species without a specific permit or exemption (50 C.F.R 217.12). "Harm" is further defined by the NMFS Final Rule to include significant habitat modification or degradation that results in death or injury to listed species by "significantly impairing behavioral patterns such as breeding, spawning, rearing, migrating, feeding, and sheltering". "Harass" is defined as actions that created the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to breeding, feeding, and sheltering. Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such takings is in compliance with the terms and conditions of this incidental take

statement.
An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

A. Amount or Extent of Take Anticipated

The NMFS anticipates that the proposed actions will result in incidental take through injury or mortality of juvenile and/or adult salmonids. The numerical amount of expected take is difficult to determine, and therefore has not been quantified. The extent of take is limited to a 350 m portion of each of the following streams: Thompson Creek (North Fork Nooksack), Buck Creek (Suiattle), Sulphur Creek (Suiattle), Downey Creek (Suiattle), Silver Springs Creek (Puyallup/White), Huckleberry Creek (Puyallup/White), Clearwater Creek (White), and Greenwater River (White).

B. Reasonable and Prudent Measures

Electrofishing shall be conducted in accordance with NMFS' Electrofishing Guidelines (Appendix A). Additionally, the following reasonable and prudent measures are necessary to minimize incidental take of PS chinook:

1. The USFWS shall implement measures to minimize take associated with electrofishing.

2. The USFWS shall implement measures to minimize take associated with capturing, handling, and releasing fish.

3. The USFWS shall provide written reports to NMFS that describe results from electrofishing activities.

4. All conservation measures proposed by USFWS shall be fully implemented as reported in the description of the proposed action.

5. The USFWS shall reinitiate consultation with NMFS if streams other than those analyzed in this BO will be surveyed.

C. Terms and Conditions

To comport with ESA section 7 and to be exempt from the prohibitions of ESA section 9, the applicant must comply with the terms and conditions that implement the reasonable and prudent measures. There

terms and conditions are non-discretionary.

1. The USFWS shall implement the following measures to minimize take associated with electrofishing:

a. Prior to sampling, crews shall conduct visual surveys to ensure that there are no redds or adult fish in the vicinity of the sample area. Surveys shall be conducted in each 100 m section. Electrofishing is prohibited in the vicinity of redds or where adult anadromous salmonids are present.

b. Electrofishing shall not be used in the Bull Trout Habitat Study. Day and night snorkel surveys will be employed as the primary sampling method in that study.

c. No electrofishing shall be conducted when water temperatures exceed 18 C. During periods of high water temperature, sampling shall occur early in the morning or in the evening before dark.

d. All crew members shall be made aware of the reasonable and prudent measures prior to the onset of field sampling.

e. Electrofishing will occur in a 350 m or LESS portion of each stream during the Sampling Efficiency Project.

2. The USFWS shall implement the following measures to minimize take associated with capturing and handling of fish:

a. Pacific salmonids listed under ESA shall be handled with extreme care and kept in the water to the maximum extent possible during sampling and processing procedures. Circulation and replenishment of water in holding units is required and shaded containers and supplemental oxygen should be available at each sample location.

b. All juvenile chinook, chum, or steelhead fish captured during electrofishing shall be returned to the stream (outside the block-net area) prior to the processing of other species. Young-of-the-year salmonids shall be held in separate buckets to avoid predation by other fish (e.g.- bucket predation).

c. Surveyors shall observe the condition of sampled fish. If fish appear stressed or injured (dark bands, gulping air, excessive mucus, irregular swimming, or bucket predation), immediately halt sampling and decrease the frequency and voltage.

d. There shall be no fin clipping and no use of anesthetics on Pacific salmonids listed under the

ESA.

e. To avoid injury or mortality of fish, surveyors will clean the nets at each sample location at least twice per 24 hours.

3. The USFWS shall report on the following:

a. By August 30, 2000, project leaders shall provide a report on sampling mortalities and observed injuries for all sample sites.

b. Any salmonid listed as threatened or endangered under NMFS' jurisdiction that is killed during electrofishing shall be placed in 95% ethanol. Surveyors shall record the date, precise location, species, and any other pertinent information.

c. Surveys to be conducted in 2001 and 2002 are contingent upon an annual report due to NMFS by December 31, 2000. The report must include the following: (a) a detailed description of the total number of each species observed in each stream; (b) the number of mortalities and observed injuries for each species in each stream; (c) preliminary results from the data; (d) and written information on any changes to sampling locations.

X. REFERENCES

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ELECTROFISHING GUIDELINES

Suggested protocol for the use of backpack electrofishing equipment in waters containing fish listed under the Endangered Species Act (ESA).

These recommendations should be seen as guidelines for developing consistent and safe electrofishing technique. It is hoped that these guidelines will ultimately help improve electrofishing technique in ways which will reduce fish injury and increase electrofishing efficiency.

Purpose and Scope

The purpose of this document is to recommend guidelines for using backpack electrofishing equipment to sample ESA-listed fish. Because electrofishing can kill or severely injure fish, every effort should be made to avoid electrofishing and use snorkeling or other fishery information collection techniques. Where electrofishing is the only suitable sampling method, these guidelines are suggested to help reduce the number of fish killed or severely injured.

These guidelines are concerned only with studies that involve electrofishing juvenile or adult salmonids that are *not* in spawning condition. Electrofishing in the vicinity of adults in spawning condition or operating equipment in the vicinity of redds containing developing eggs is not discussed as there is no justifiable basis for permitting these activities near listed species.

Also, these guidelines do not deal with factors such as temperature or fish handling technique both of which can significantly affect fish health during an electrofishing session. None the less, all ESA-listed fish must be sampled with extreme care. The field crew must carefully design the sampling sessions to minimize fish stress by working within favorable temperature regimes, using anesthetics when necessary, and minimizing the time the fish are held before release. As with all fieldwork involving live ESA-listed fish, the best science should be used along with an experienced crew and good equipment in order to minimize handling stress.

Equipment

Equipment should be in good working condition. Operators should go through the manufacturer's preseason checks, adhere to all provisions, and record major maintenance work in a log.

Training

A crew leader having at least 100 hours of electrofishing experience in the field using similar equipment

should train the crew. The crew leader's experience must be documented and available for confirmation; such documentation may be in the form of a logbook. The training should occur before an inexperienced crew begins any electrofishing; it should also be conducted in waters that do not contain ESA-listed fish.

The training program must include the following elements:

1. Definitions of basic terminology: e.g. galvanotaxis, narcosis, and tetany.
2. An explanation of how electrofishing attracts fish.
3. An explanation of how gear can injure fish and how to recognize signs of injury.
4. A review of these guidelines and the manufacturer's recommendations.
5. A demonstration of the proper use of electrofishing equipment, the role each crew member performs, and basic gear maintenance.
6. A field session where new individuals actually perform each role on the electrofishing crew.

Specific Electrofishing Guidelines

1. In order to avoid contact with spawning adults or active redds, carefully survey the area to be sampled before beginning electrofishing.
2. Measure conductivity and set voltage as follows:

Conductivity (umhos/cm)	Voltage
Less than 100	900 to 1100
100 to 300	500 to 800
Greater than 300	150 to 400

3. Only direct current (DC) should be used.
4. Each session should begin with pulse width and rate set to the minimum needed to capture fish. These settings should be gradually increased only to the point where fish are immobilized and captured. Start with pulse width of 500us and do not exceed 5 milliseconds. Pulse rate should start at 30Hz and work carefully upwards. *In general*, exceeding 40 Hz will injure more fish.
5. The zone of potential fish injury is 0.5m from the anode. Care should be taken in shallow waters, undercut banks, or where fish can be concentrated because in such areas the fish are more likely to come into close contact with the anode.
6. The stream segment should be worked systematically, moving the anode continuously in a herringbone pattern through the water. Do not electrofish one area for an extended period.
7. Crew should carefully observe the condition of the sampled fish. Dark bands on the body and longer recovery times are signs of injury or handling stress. When such signs are noted, the settings for the electrofishing unit may need adjusting. Sampling should be terminated if injuries occur or abnormally long recovery times persist.

8. When the sampling design involves taking scales and measurements, a healthy environment for the stressed fish must be provided and the holding time must be minimized. For these operations, additional crew members who are experienced in holding and processing stressed fish may be necessary.
9. Whenever possible, a block net should be placed below the area being sampled to capture stunned fish that may drift downstream.
10. The electrofishing settings should be recorded in a logbook along with conductivity, temperature, and other variables affecting efficiency. These notes, together with observations on fish condition, will improve technique and form the basis for training new operators.